



Installation Guide



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Turn Key Engine supply was founded with the intent of providing both the professional and amateur installer with the most comprehensive and flexible engine packages possible. The combination of state of the art engines and our extensive research results in packages that ensure maximum performance, reliability and ease of installation. We assemble engines with new OEM components where applicable, we may modify and/or interchange components as necessary to meet specific application requirements.

Every effort has been made to ensure we provide a TURN KEY package, as applications will vary widely we can not guarantee that this package includes everything you will need for your installation. We will be happy to assist you with your specific application.

As every application is different it would be impossible to provide all the information necessary to complete installations for every application. This document is intended as a guide and does not provide a step-by-step explanation of what is required to successfully install the engine. Every effort has been made to accurately summarize the information necessary for you to install and maintain your TURN KEY engine. It is assumed that the installer has the knowledge and expertise to successfully install the engine.

We highly recommend that you consult an OEM Service Manual, follow generally accepted safety practices and seek professional assistance when necessary.

The General Motors family of Gen 3 V8 engines is very similar and often uses components that are identical or interchangeable. Turnkey Engine Supply has invested in considerable research and development to ensure the engine package you receive will offer the maximum performance and reliability for your application. In some cases the actual components (example: sensors) and their different configurations (example: belts) are different from those installed during manufacturing. This is done to enhance performance and reliability, when applicable we utilize new General Motors components. In some cases it is necessary for us to utilize custom components or modified components to ensure an optimum "Turn-Key" package (example: ECM and Wiring Harness). In the event you need to replace components we recommend you contact our technical department to ensure proper components are used.

Emissions laws vary from state to state, you **MUST** understand and adhere to the applicable laws. In some cases this package may only be legal for off road applications.

These are high performance products and Turn Key Engine Supply assumes zero liability as a result of improper use or inexperience of use.

OIL

The LS engine requires oil that meets or exceeds the American Petroleum Institute standards for SL. 10W-30 is what we recommend; we do not recommend the use of synthetic oil until the completion of break in procedure and 15 hours of normal operation time. We recommend for off road use changing your oil for every 20 hours of operating time.

Oil Pressure

A sending unit bung is provided to be installed behind the intake manifold above the bell housing. You can also drill and tap by the oil filter if this bung is not accessible.

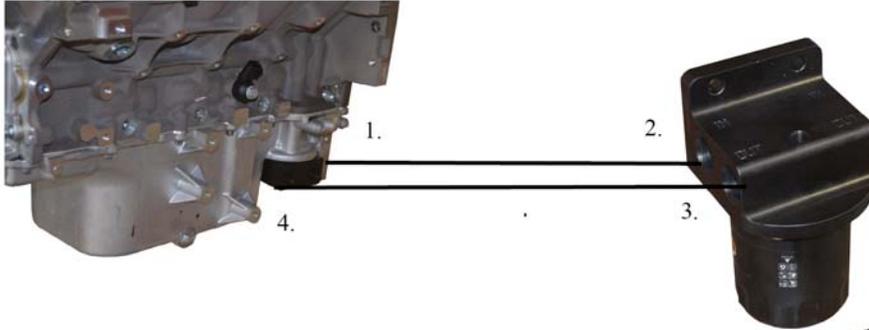


!!!IMPORTANT!!!

OIL COOLER – WARRANTY VOID IF INSTRUCTIONS NOT FOLLOWED

If you are going to be using an oil cooler, or remote filter be sure to route the oil lines correct!

Remote oil filter



1. Oil out of engine flywheel side
2. Oil into filter
3. Oil out of filter
4. Oil into engine pulley side

* A 1/8 NPT port is present for a pressure/temp. sensor but can also be plugged.

* 2 input and 2 output ports are available. Use the most convenient ports and plug the other 2



!!!WARNING!!!

- Mount as close to the engine as possible.
- All ports are AN-10 O-Ring-NO TEFLON.
- Minimum of AN-10 or 5/8 line.
- No more than a total of 360 degrees of combined fittings.
- No cast angle fittings, only full flow radius fittings.
- Always filter after the cooler.

- Fram HP1
- AC-Delco HD222
- AC-Delco PF2217
- CARQUEST 185515
- CARQUEST 85622
- General Motors GM 25010543
- NAPA 1622
- Wix 51515R
- Wix 51622



Full flow radius- Good!



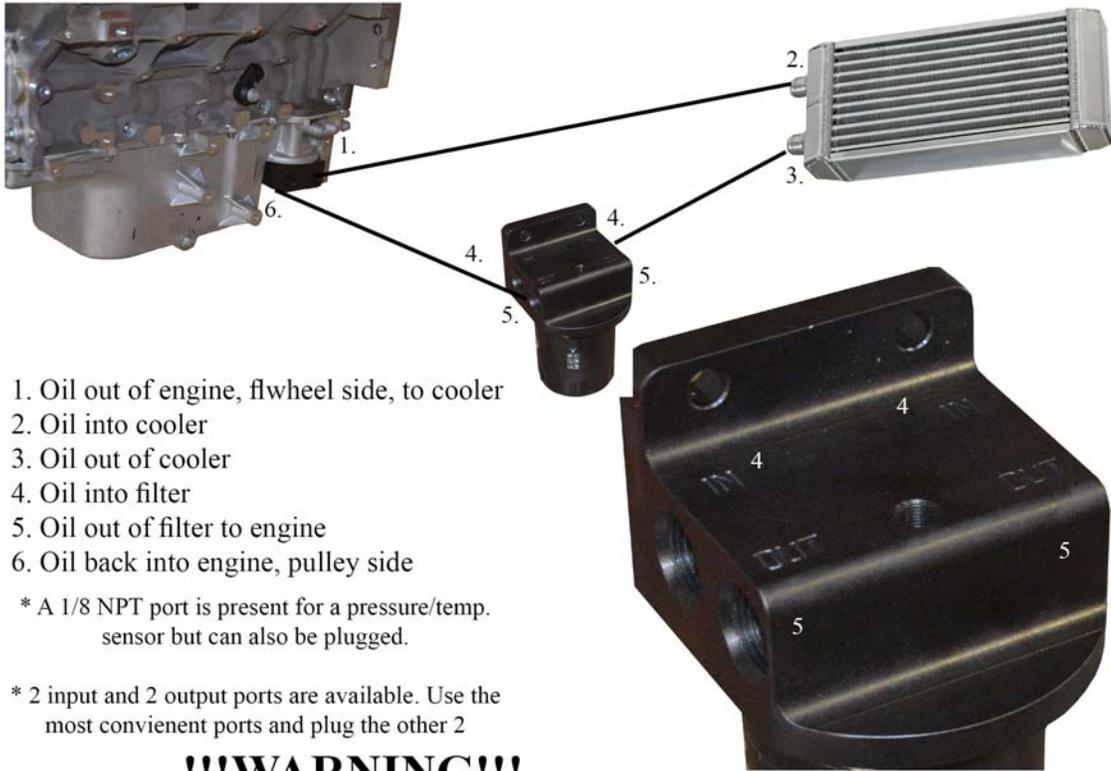
Cast angle fitting
DO NOT USE!!!

!!!IMPORTANT!!!

OIL COOLER – WARRANTY VOID IF INSTRUCTIONS NOT FOLLOWED

If you are going to be using an oil cooler, or remote filter be sure to route the oil lines correct!

Remote filter with oil cooler



!!!WARNING!!!

- Must have a high volume oil pump installed in the engine.
- Mount as close to the engine as possible.
- All ports are AN-10 O-Ring-NO TEFLON.
- Minimum of AN-10 or 5/8 line.
- No more than a total of 360 degrees of combined fittings.
- No cast angle fittings, only full flow radius fittings.
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Full flow radius- Good!



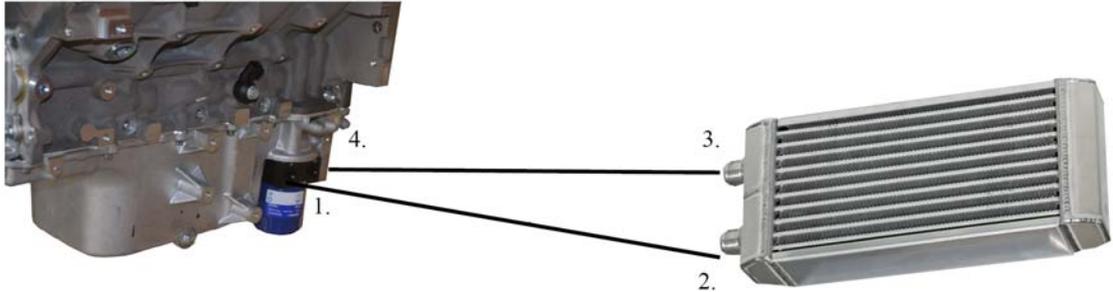
Cast angle fitting
DO NOT USE!!!

!!!IMPORTANT!!!

OIL COOLER – WARRANTY VOID IF INSTRUCTIONS NOT FOLLOWED

If you are going to be using an oil cooler, or remote filter be sure to route the oil lines correct!

Remote cooler/ On board filter



1. Oil out of engine to cooler pulley side
2. Oil into cooler
3. Oil out of cooler
4. Oil into filter flywheel side

!!!WARNING!!!

- Must have a high volume oil pump installed in the engine.
- Mount as close to the engine as possible.
- All ports are AN-10 O-Ring-NO TEFLON.
- Minimum of AN-10 or 5/8 line.
- No more than a total of 360 degrees of combined fittings.
- No cast angle fittings, only full flow radius fittings.

- AC-Delco PF48
- AC-Delco PF64
- CARQUEST 84060
- CARQUEST 84073
- General Motors GM 12626224
- General Motors GM 12640445
- General Motors GM 89017524
- General Motors GM 98017342
- NAPA 7060
- NAPA 7073
- Wix 57060
- Wix 57073



Full flow radius- Good!



Cast angle fitting
DO NOT USE!!!

FUEL - (See routing diagram starting on pg 10)

This engine requires fuel with an octane rating of 91. Higher octane fuels are neither required nor recommended. Serious engine damage could occur if the proper fuel is not utilized. The use of high quality pre-pump filter (100 micron) is required to avoid damage to fuel pump. A 35 micron post pump filter is required to avoid damage to the injectors.

Fuel Fitting Guide – (See routing diagram starting on pg 10)

We recommend using the use of full flow AN fittings.

Rule of thumb is never use more than 360 degrees of fuel fittings in your pressure line.

170 – 349 H.P AN -6 or 3/8”
350 - 600 H.P AN – 8 or 1/2”
600+ H.P AN – 10 or 5/8”

Fuel Pump -(See routing diagram starting on pg 10)

If you did not obtain a fuel pump kit with the engine package we recommend the installation of an EFI high volume/high pressure fuel pump rated at 50-100 PSI

Fuel Pressure on all applications should be set at 58 P.S.I

Fuel Filter - (See routing diagram starting on pg 10)

If you did not obtain a fuel filter with the engine package we recommend the installation of an EFI Pre Pump filter (100 micron) and post pump filter (35 micron)

Fuel Lines - (See routing diagram starting on pg 10)

The stock fuel rail has been modified to accept a minimum of AN-6 lines. Depending on the horsepower of your engine, larger fuel lines may be required. Most applications utilize a pressure regulator that requires a pressure return line.

On all packages we highly advise you set your fuel pressure to 58 PSI at the fuel rail.

Failure to comply could result in serious damage to your engine.

Fuel Lines – Off Road Compliant Engines Only

In order for your vehicle to be compliant to the evaporative standards you must construct all of your models with a fuel system tank made of metal (Aluminum) and fuel lines that meet SAE J2260 or SAE J30 (R11-A and R12). Compliant products are currently made by Goodyear, Avon, Gates, Dana, Mark IV auto, and others.

Exhaust System – Off Road Compliant Engines Only

The supplied exhaust system is composed of 3 components and is designed to be installed as is. Your engine has been certified to California ARB and US EPA emissions standards with this supplied exhaust system. The O2 sensors are to be placed in the designated locations when the exhaust is installed.

Power Steering

If your package came equipped with power steering you must fill the reservoir with and OEM approved fluid before starting the engine.

Cooling System

To ensure proper operation a radiator and cooling fans capable of maintaining a normal operating temperature of 180-210 degrees must be installed. The water pump on LS Engines rotate opposite the crank. Therefore radiator lines go from top to top, and bottom to bottom. As every application is different it is impossible for us to recommend a radiator and fan combination for your application. Serious consideration should be given to the set up of your cooling system; we recommend you seek professional advice if you are not absolutely sure of the requirements of your application. You must ensure your entire cooling system is filled with coolant before starting the engine.

***Note* the air bleed tube must be hooked up to a pressure side of the cooling system i.e. radiator lines, or radiator tank (not overflow).**



Water Temperature

A sending unit for an aftermarket water temperature gauge can be installed on the head of the passenger side of the engine.

The thread pitch is 1/4 N.P.T



Starter

When using a VW variant transaxle you must use a “high torque” style starter, use of a standard VW starter WILL result in damage to the starter.

Automatic Transmission

Turbo 350
Turbo 400
700R4

These transmissions require a bushing between the crank and torque converter. Do not install one of these automatic transmissions without the bushing, failure to do so could cause serious damage.



Air Cleaner

Never operate this engine without a proper air cleaner installed. We recommend the use of an “outer wear” for off road applications. To ensure proper operation, clean your air filter regularly. Throttle body accepts a K&N filter with 4 inch opening.

Break In Procedure

Upon initial start up, verify minimum oil pressure of 20 PSI at 2000 RPM. This is a new engine and must be properly broken in before high RPM/Load use. We advise against high RPM/Load use during the break in period. To protect sensitive engine parts during break in the ECM is programmed to limit the engine RPM as follows...

- 1st hour 4000 R.P.M
- 2nd hour 5000 R.P.M
- 3rd hour 6000 R.P.M
- 4th hour 6000 to 7200 R.P.M depending on application

Check oil before starting engine, check often during break in period. We recommend the oil and filter be changed after the initial 15 hours of use.

Electrical

The wire harness included with this package has been developed to ensure maximum reliability and ease of installation. It is imperative that these connections be made correctly; otherwise serious damage or fire may result.

To maintain reliability and avoid fire, the wire harness and ECM must be installed properly. It is absolutely critical that the engine and chassis be connected to a common ground that ultimately terminates at the NEGATIVE battery post. Be careful to avoid running wires where they may be pinched or insulation compromised; ensure wires do not come in contact with exhaust or high heat. Ensure engine chassis and battery is properly grounded before connecting wire harness/ECM. To avoid causing damage always disconnect the negative battery lead before removing the ECM.

Sensors

In some cases it may be necessary for us to install sensors that may be different than those installed by the OEM.

If replacement is necessary we recommend you contact Turnkey Engine Supply to ensure proper replacements of sensors are used.

Maintenance – See last page

Proper maintenance is required to ensure proper operation and longevity from this engine. We advise you to follow the recommended maintenance intervals found on the last page of this document.

We carry a large inventory of replacements and performance parts; we recommend you contact Turnkey Engine Supply before installing any replacement or performance parts.

!!!ENGINE WARRANTY!!!

This engine is intended for off road/racing applications. The OEM provides NO warranty coverage for engines used in these applications. Due to the heavy duty use we provide a limited warranty for the break in period or 90 days, whichever comes first. This warranty covers defects in materials and workmanship only. It does not cover installation or user related problems. If you believe you have a failure that is covered under this warranty, we recommend you contact the installer/point of purchase 1st as the majority of problems are easily resolved. Please have the installer/point of purchase contact Turnkey Engine Supply to verify coverage. We Do NOT accept engines, parts, or complete cars at our business without prior confirmation.

The Delphi Mefi 4 & 5

Marine Electronic Fuel Injection MEFI-4 & 5

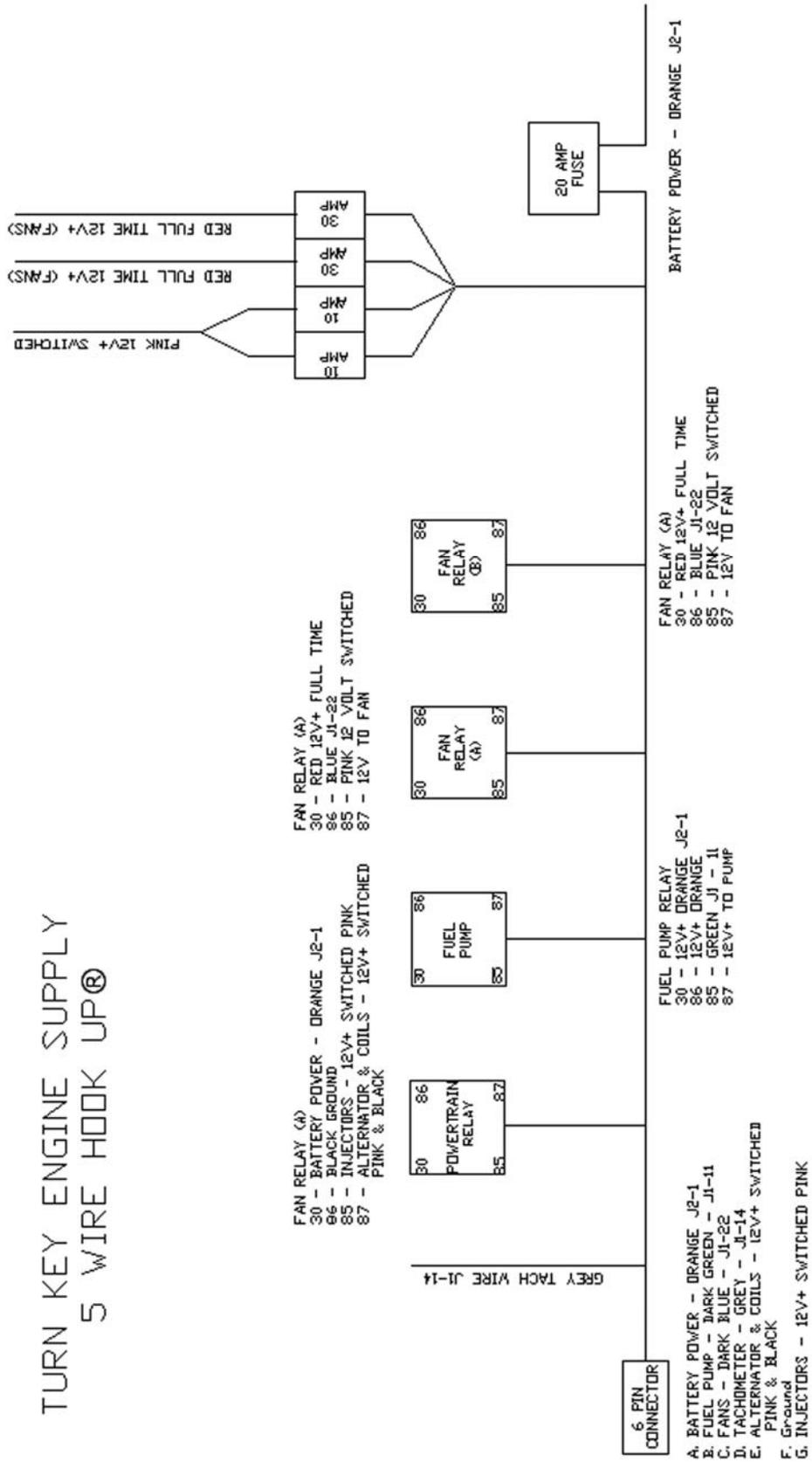
Features:

- Cooling Fan Control
- RPM Reduction; ECM will automatically limit engine RPM if the coolant temperature exceeds 235 degrees and will automatically reset after the ignition is turned off and the engine has cooled below 230 degrees.
- RPM Control; Pre programmed rev limit
- Break in Mode; (see break in procedure)

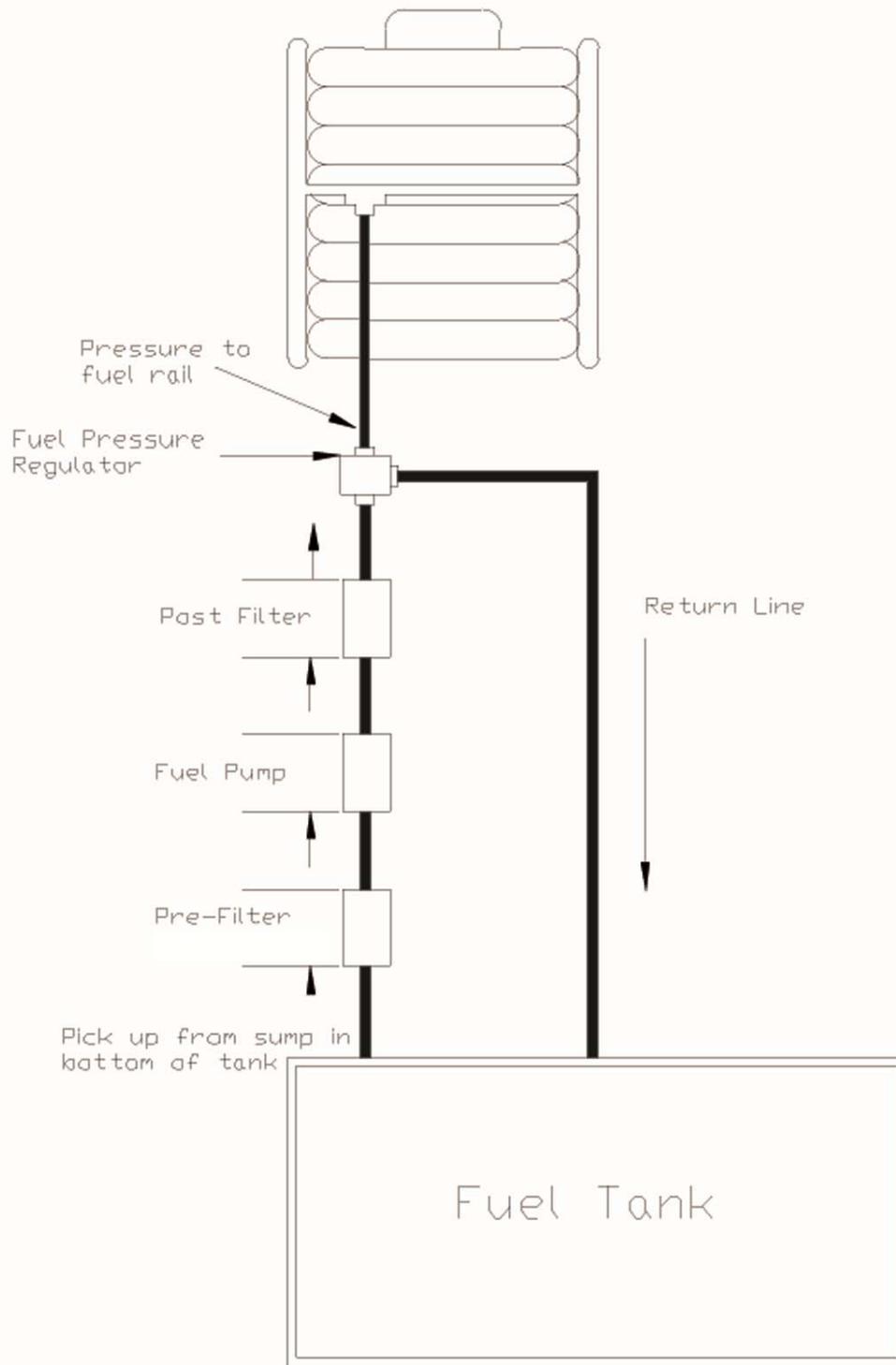
Wire Harness

- Customer harness built to meet OEM specifications
- Includes fuses and relays for ECM, Fan A, Fan B, and Fuel Pump
- 12V Pos Connect directly to positive side of battery or equivalent.
- 12V Ground Connect to negative battery terminal or engine.
- Ignition Connect to +12 VDC from ignition switch. Ensure this connection maintains +12 VDC when ignition is in the “ON” position and while starter is engaged.
- Fan Load A This circuit is controlled by the ECM (via relay and fuse) and supplies as +12 VDC when the coolant temperature reached the target temperature. Connect to +12 VDC terminal on cooling fan “A”. Ensure the fan is properly grounded.
- Fan Load B This circuit is controlled by the ECM (via relay and fuse) and supplies as +12 VDC when the coolant temperature reached the target temperature. Connect to +12 VDC terminal on cooling fan “B”. Ensure the fan is properly grounded.
- Fuel Pump Load this circuit supplies +12VDC when ignition is switched “ON”. Connect to +12 VDC terminal on the fuel pump. Ensure that the fuel pump is grounded.
- Tachometer Connected to input on tachometer. Refer to gauge mfg. information to ensure the tachometer is set-up for V8 operation.

TURN KEY ENGINE SUPPLY 5 WIRE HOOK UP®



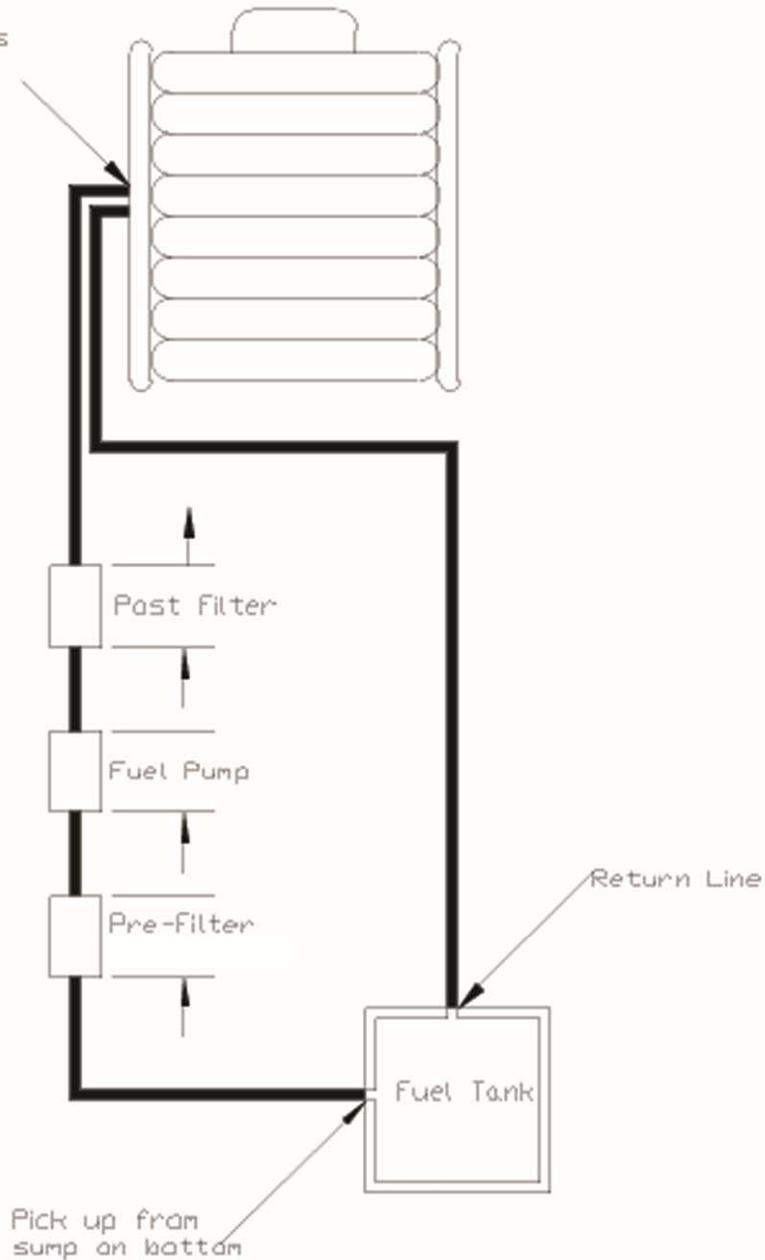
Low Intake Single Fuel Line



*Note all fuel pick up's should be AT LEAST 3/8" minimum see sizing guide on page 3
** Warranty void unless fuel system is resembles this drawing

Tall Intake Dual Fuel Lines

Top line is
pressure
Bottom line is
return



*Note all fuel pick up's should be AT LEAST 3/8" minimum see sizing guide on page 3
** Warranty void unless fuel system is resembles this drawing

Blower/Turbo Intake Single Fuel Line

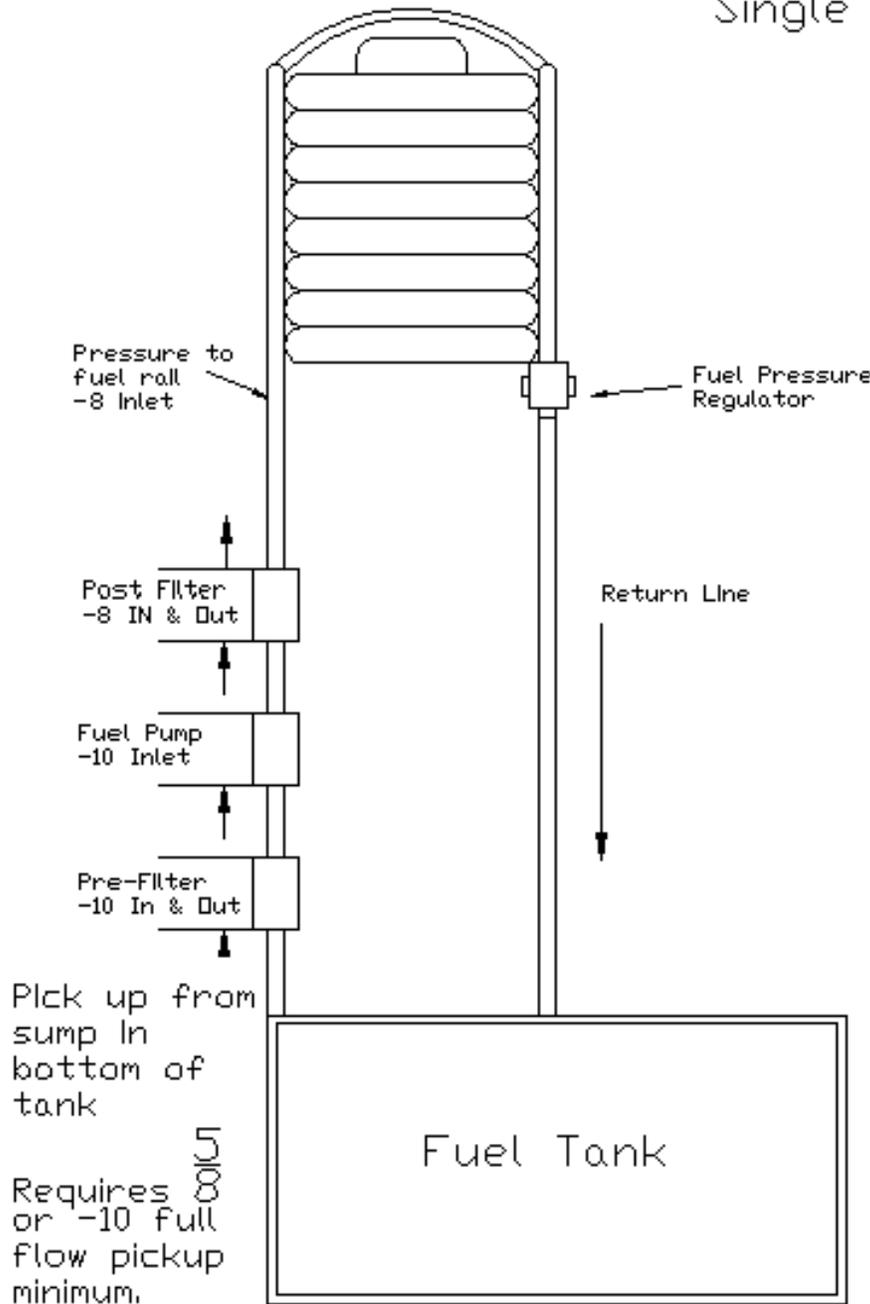


Figure 1

*Note all fuel pick up's should be AT LEAST 5/8" minimum see sizing guide on page 3

** Warranty void unless fuel system is resembles this drawing

	DATE	INTERVAL HOURS						
		Daily	15	30	50	100	250	
GENERAL MAINTENANCE SECTION								
Inspect fuel system for leaks	Prior to any maintenance activity	X						
Inspect engine for fluid leaks		X						
Check engine oil		X						
Replace engine oil and filter				X				
Inspect accessory drive belts		X						
Inspect electrical system			X					
Inspect vacuum lines and fittings				X				
Inspect all fuel fittings and hoses			X					
Check engine compression pressure							X	
ENGINE COOLANT								
Check Engine Coolant Level		X						
Replace Coolant							X	
Inspect coolant hoses for leaks, cracks, swelling, or deterioration						X		
ENGINE IGNITION								
Inspect battery for case damage and corroded cables						X		
Inspect ignition system						X		
Check ignition timing - adjust as necessary	Service Dealer	N/A						
Replace spark plugs						X		
FUEL FILTER								
Check Fuel PSI Gasoline					X			
Replace fuel filter					X			
Inspect fuel lines and connections			X					
PRESSURE REGULATOR SECTION								
Test regulator pressure LPG/NG	Primary							
Inspect regulator for oil build-up	Service Dealer							
Inspect regulator assembly for fuel/coolant leaks								
FUEL INJECTION SYSTEM								
Check for air leaks in filter system						X		
Check for leaks on air intake system			X					
Check restriction indicator		N/A						
Inspect Air Cleaner			X					
Clean air filter element	clean air filter as conditions require or at 30 hours							
Inspect air/gas valve assembly (Throttle)		N/A						
Inspect air/fuel mixture throat		N/A						
ENGINE EXHAUST SECTION								
Inspect Exhaust Manifold for leaks						X		
Inspect manifold-to-muffler exhaust piping and connections for leaks						X		
Inspect muffler for cracks and leaks						X		
Inspect catalyst inlet and outlet for leaks						X		
<p><i>For application variables, reference your owners' manual.</i></p> <p>**Please return to regular Hourly Maintenance intervals once 250 hours have been reached**</p>								